

Electromyographic Examination in the Office

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DURING THE PAST SEVERAL YEARS, electromyographic examinations have been requested more and more frequently by physicians in several specialties in the area about Los Angeles. It becomes pertinent, therefore, to turn attention to what specialists make the most use of electromyography, to the kinds of neurological lesions that cause them to refer patients most frequently, and to satisfactory methods of communicating electromyographic data to a referring physician.

All the patients discussed in this paper were examined in my private office during a recent period of 12 months. This point is mentioned because it appears likely that the results might be somewhat different if hospital patients were included. The recordings were made by inserting one insulated monopolar needle electrode into each of the various muscles examined. All examinations were done with the Meditron Electrograph Model 201 A.

For reasons that will become apparent later, data on patients having suspected root compression and peripheral nerve lesions are dealt with separately in this study rather than included under the broad category of lower motor neuron disease. It should further be pointed out that patients having suspected plexus lesions were included with the group having suspected peripheral nerve injuries. The category *lower motor neuron disease* in this study includes patients having either residual poliomyelitis or progressive spinal muscular atrophy, whereas the category *primary muscles disorders* includes patients having either myotonia or progressive muscular dystrophy.

The muscles most frequently examined electromyographically and the peripheral and segmental motor supply of each are shown in Table 1. These muscles are readily accessible for examination and their peripheral and segmental motor supply is quite accurately known. In addition, the electromyographic data obtained from the examination of these muscles enables one to express a satisfactory opinion concerning the various types of neurological lesions most frequently seen in the practice of the specialists who referred the patients for examination.

A total of 560 electromyographic examinations were done during the 12 months of this study. The

• During a recent 12-month period, a total of 560 patients were referred for electromyographic examinations. They were sent by orthopedic surgeons, neurosurgeons, internists, general practitioners, neuropsychiatrists and practitioners of physical medicine. Orthopedic surgeons referred more than any other specialists.

Results of examination of patients referred because of suspicion of root compression were much more often negative than positive. Results were positive for the disease in all cases in which referral was because of suspicion of lower motor neuron disease, primary muscle disorders and upper motor neuron disease.

Short electromyographic reports that concentrate on interpreting the electromyographic data were found to be preferred by the referring physicians.

TABLE 1.—Muscles Frequently Examined Electrographically

ANTERIOR DIVISION MUSCLES			
Upper Extremity	Peripheral Nerve	Root Supply	
		Major	Minor
Deltoid.....	Axillary.....	C-5	C-4, 6
Biceps.....	Musculocutaneous.....	C-6	C-5
Triceps.....	Radial.....	C-7	C-6
Brachioradialis.....	Radial.....	C-5	C-6
Flex. carpi radialis.....	Median.....	C-7	C-6, 8
Flex. carpi ulnaris.....	Ulnar.....	C-7	C-6
Abd. pollicis long.....	Radial.....	C-8	C-7
Opponens pollicis.....	Median.....	C-8	C-7
First dorsal interos.	Ulnar.....	C-8	C-7
Abd. digiti quinti.....	Ulnar.....	T-1	C-8
Lower Extremity	Peripheral Nerve	Root Supply	
		Major	Minor
Iliopsoas.....	Femoral.....	L-2	L-1, 3
Adductor longus.....	Obturator.....	L-3	L-2, 3
Vastus lateralis.....	Femoral.....	L-4	L-2, 3
Tibialis anterior.....	Peroneal.....	L-4	L-5
Ext. hallucis long.....	Peroneal.....	L-5	L-4
Peroneus longus.....	Peroneal.....	L-5	S-1
Gastrocnemius:			
Lateral head.....	Tibial.....	S-1	L-5, S-2
Medial head.....	Tibial.....	S-2	S-1
Lateral hamstring.....	Tibial.....	S-1	L-5, S-2
Medial hamstring.....	Tibial.....	L-5	L-4, S-1
POSTERIOR DIVISION MUSCLES			
Neck			
Semi spinalis capitis.....		C-1	to C-6
Semi spinalis cervicis.....		C-6	to T-2
Low Back			
Multifidus.....		L-1	to S-3

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results were positive for lesions in 181 cases (32.4 per cent) and negative in 379 cases (67.6 per cent).

Orthopedic surgeons referred more patients than any other specialists (Table 2) and practitioners of physical medicine relatively few (but it should be noted that many of the latter do electromyography themselves).

The most frequent reason for referral for electromyographic examination (Table 3) was suspicion of root compression, a fact that does not accord with a rather general assumption that electromyography is most often used for examination of patients with suspected peripheral nerve injuries.

Results of electromyographic examination of patients suspected of having root compression syndromes were negative much more frequently than positive, whereas for all other types of lesions, results were positive far more often than negative (Table 4). Results were positive for the disease in all cases of patients referred with suspected lower motor neuron disease, primary muscle disorders and upper motor neuron disease.

REPORTS TO REFERRING PHYSICIANS

I used to make long reports to the referring physicians, including not only the names of the various muscles examined, but also the electromyographic abnormalities noted for each muscle. However, upon learning that referring physicians usually do not desire so much detail, a simpler form of report, summarizing the examination and the results, was adopted.

To illustrate, suppose that a patient with suspected cervical root compression syndrome is referred for electromyographic examination. Then, after taking a rather careful history, suppose that the muscles supplied by the anterior and posterior primary divisions of the fourth cervical nerve through the first thoracic roots on the left were examined and no electromyographic abnormalities were elicited. The report to the referring physician would be as follows:

John Doe
111 A Street
City B, California
Age 40

Refer: Z. A. Brown, M.D.

ELECTROMYOGRAPH REPORT 3/4/57

Electromyograms of selected muscles supplied by the anterior and posterior primary divisions of the fourth cervical root through the first thoracic root on the left revealed no denervation or fasciculation activity in any of the areas sampled. Under voluntary effort, simple motor unit waves ranging in magnitude from 100 to 1,100 microvolts were elicited from all areas. There was no spontaneous motor unit

TABLE 2.—Number of Electromyographic Examinations Requested by Various Specialists

Specialty	No. of Patients	Per Cent of Total
Orthopedic surgery.....	267	47.6
Neurosurgery.....	161	28.7
Internal medicine.....	45	8.1
General practice.....	43	7.7
Neurology and psychiatry.....	27	4.8
Physical medicine.....	17	3.1

TABLE 3.—Number of Patients Referred with Various Suspected Lesions

Suspected Lesion	No. of Patients	Per Cent of Total
Root compression syndrome.....	446	79.7
Peripheral nerve injury.....	98	17.4
Lower motor neuron disease.....	6	1.1
Primary muscle disorder.....	6	1.1
Upper motor neuron disease.....	4	0.7

TABLE 4.—Number of Positive and Negative Results of Electromyographic Examinations of Patients with Various Suspected Lesions

Suspected Lesion	No. of Patients	Per Cent of Total
Root compression syndrome:		
Positive.....	85	15.2
Negative.....	361	64.5
Peripheral nerve injury:		
Positive.....	80	14.3
Negative.....	18	3.1
Lower motor neuron disease:		
Positive.....	6	1.1
Primary muscle disorder:		
Positive.....	6	1.1
Upper motor neuron disease:		
Positive.....	4	0.7

activity on passive movement, and the needle resistance was normal in all areas.

Impression: There were no diagnostic abnormalities in the electromyograms of selected muscles supplied by the anterior primary and posterior primary divisions of the fourth cervical through the first thoracic roots on the left.

Comments: At present, I am unable to demonstrate anything in the electromyograms of selected muscles supplied by the anterior and posterior primary divisions of the fourth cervical root through the first thoracic root on the left which would account for this patient's complaints. If after you complete your studies nothing further is found, I shall be glad to reevaluate him at a later date and report any changes noted.

If, on the other hand, the electromyographic examination on this patient had revealed denervation

activity in about 10 per cent of the areas sampled of the muscles supplied by the seventh cervical root, the report would be as follows:

Electromyograms of selected muscles supplied by the anterior and posterior primary divisions of the fourth cervical through the first thoracic roots on the left revealed denervation activity in about 10 per cent of the areas of the muscles supplied by the anterior and posterior primary divisions of the seventh cervical root. No fasciculation activity was elicited from any of the areas sampled. Under voluntary effort, simple motor unit waves ranging in magnitude from 100 to 1,100 microvolts were

elicited from most areas. There was no spontaneous motor unit activity on passive movement, and the needle resistance was normal in all areas sampled.

Impression: The electromyographic findings are consistent with denervation activity in about 10 per cent of the areas of the muscles supplied by the anterior and posterior primary divisions of the seventh cervical root on the left.

Comments: Considering the history, the present electromyographic findings would be most consistent with a moderately severe root compression syndrome involving the seventh cervical root on the left.

1060 East Green Street, Pasadena.

For Your Patients—

A Personal Message to YOU:

As your personal physician I consider it both a privilege and a matter of duty to be available in case of an emergency. Consequently, I thought it would be a good precaution if—on this gummed paper which can be pasted in your telephone book or medicine cabinet—I listed the numbers where I can be reached at all times. They are:



OFFICE

HOME

Sincerely,

_____, M.D.

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